What is claimed is:

1. An apparatus for transporting a high speed data stream over a channel made up of a plurality of relatively low bandwidth twisted copper pair lines, comprising

an encoder for applying an error correction encoding scheme to said high speed data stream;

a plurality of modem elements coupled to said plurality of twisted copper pair lines, each modem associated with one of said copper pair lines and configured to operate at a data rate independent of other modem elements;

a dispatcher operative to divide said encoded high speed data stream into a plurality of low rate data streams to be transmitted by said plurality of modem elements, said dispatcher adapted to forward a low rate data stream to each modem in accordance with the data rate of each modem;

a collector operative to combine a plurality of data streams received by said plurality of modem elements into a received high speed data stream;

a decoder adapted to receive said data stream output from said collector and to apply an error correction decoding scheme so as to generate the original high speed data stream.

2. The apparatus according to claim 1, wherein said dispatcher comprises means for interleaving said encoded high speed data stream before distribution to said plurality of modem elements.

3. The apparatus according to claim 1, wherein said collector comprises means for de-interleaving said received high speed data stream.

4. The apparatus according to claim 1, further comprising an interleaver operative to divide codewords generated by said encoder into a plurality of shorter data segments, said shorter data segments forwarded to said dispatcher such that during any period of time only a portion of a codeword is transmitted over said plurality of twisted copper pair lines so as to provide protection from burst noise.

5. The apparatus according to claim 1, further comprising a scrambler adapted to scramble said high speed data stream before said error correction coding scheme is applied by said encoder.

6. The apparatus according to claim 1, further comprising a de-scrambler adapted to de-scramble said received speed data stream before error correction decoding by said decoder.

7. The apparatus according to claim 1, wherein said plurality of twisted copper pair lines comprises the local loop plant.

8. The apparatus according to claim 1, wherein said plurality of modem elements comprises a plurality of Asymmetric Digital Subscriber Line (ADSL) modem elements.

9. The apparatus according to claim 1, wherein said plurality of modem elements comprises a plurality of High speed Digital Subscriber Line (HDSL) modem elements.

10. The apparatus according to claim 1, wherein said plurality of modem elements comprises a plurality of High speed Digital Subscriber Line 2 (HDSL2) modem elements.

11. The apparatus according to claim 1, wherein said plurality of modem elements comprises a plurality of Symmetric Digital Subscriber Line (SDSL) modem elements.

12. The apparatus according to claim 1, wherein said plurality of modem elements comprises a plurality of Very high speed Digital Subscriber Line (VDSL) modem elements.

13. The apparatus according to claim 1, wherein said plurality of modem elements comprises a plurality of Discrete Multitone (DMT) modem elements.

14. The apparatus according to claim 1, further comprising one or more service channel modules, each service channel module adapted to provide an interface between a telephony service and said high speed data stream.

15. The apparatus according to claim 14, wherein said service channel module is adapted to interface to T1 telephony service.

16. The apparatus according to claim 14, wherein said service channel module is adapted to interface to E1 telephony service.

17. The apparatus according to claim 14, wherein said service channel module is adapted to interface to T3 telephony service.

18. The apparatus according to claim 14, wherein said service channel module is adapted to interface to E3 telephony service.

19. The apparatus according to claim 14, wherein said service channel module is adapted to interface to Integrated Services Digital Network (ISDN) telephony service.

20. The apparatus according to claim 14, wherein said service channel module is adapted to interface to Plain Old Telephone Service (POTS).

21. The apparatus according to claim 1, further comprising a test module adapted to take measurements, on a periodic basis, of one or more twisted pair line parameters.

22. The apparatus according to claim 21, wherein said line parameters comprise crosstalk between said twisted pair lines at various frequencies.

23. The apparatus according to claim 21, wherein said line parameters comprise Near End Crosstalk (NEXT) transfer functions at various frequencies.

24. The apparatus according to claim 1, further comprising means for measuring, on a periodic basis, one or more twisted pair line parameters and in accordance with said measurements, transmitting more sensitive low rate data streams over more spatial centrally located pairs within a binder.

25. The apparatus according to claim 1, further comprising means for measuring, on a periodic basis, one or more twisted pair line parameters and in accordance with said measurements, transmitting more robust low rate data streams over pairs situated closer to the outer boundary of a binder.

26. The apparatus according to claim 1, further comprising means for measuring, on a periodic basis, one or more twisted pair line parameters and in accordance with said measurements, providing variable gain control to individual pairs within a binder such that higher transmission power is assigned to the more centrally situated pairs of a binder.

27. The apparatus according to claim 1, further comprising means for excluding a particular twisted pair line from the plurality of twisted pair lines used for transmission of said high speed data stream in the event the quality of said particular twisted pair line drops below a threshold.

28. The apparatus according to claim 1, further comprising a first test module and a second test module, each located on opposite ends of said plurality of copper pair lines and wherein both are coupled to a communications link, said first test module operative to transmit a plurality of tones at different frequencies and having variable amplitudes, said second test module operative to measure the received power of each received tone and to communicate the power measurements to said first test module over said communications link.

29. The apparatus according to claim 1, further comprising crosstalk cancellation means comprising:

means for measuring a plurality of cable parameters including near end crosstalk between twisted pairs; and

means for canceling near end crosstalk from said received data stream in accordance with said cable parameter measurements.

30. The apparatus according to claim 1, further comprising Near End Crosstalk (NEXT) cancellation means, comprising:

means for generating an estimate of a NEXT transfer function of the crosstalk caused by radiators nearby to a modem;

means for generating an estimate of a NEXT disturbance signal in accordance with said estimated NEXT transfer function; and

means for subtracting said estimate of a NEXT disturbance signal from the signal received by a modem.

31. The apparatus according to claim 1, further comprising means for spatial mapping the internal structure of the cable and one or more binder sub units integral thereto containing said plurality of copper pair lines so as to yield the binder and relative position within a binder a copper pair line is located in.

32. The apparatus according to claim 31, further comprising means for assigning more spatial central pairs for upstream transmission and less spatial central pairs for downstream transmission.

33. The apparatus according to claim 31, further comprising means for applying selective gain control to different pairs within a binder in accordance with their relative position therein while limiting spectral emission at the outer boundary of said binder.

34. The apparatus according to claim 31, further comprising means for allocating different binders within said cable to separate high speed data streams.

35. The apparatus according to claim 1, further comprising means for transmitting said high speed data stream simultaneously with existing lower rate telephony signals over said plurality of copper pair lines.

36. The apparatus according to claim 1, further comprising means for multiplexing a plurality of lower rate telephony lines with said high speed data stream utilizing time division multiplexing.

37. The apparatus according to claim 1, further comprising means for demultiplexing a plurality of lower rate telephony lines from said high speed data stream utilizing time division multiplexing.

38. The apparatus according to claim 1, further comprising means for multiplexing a plurality of low frequency telephony lines with said high speed data stream comprising a higher frequency spectrum utilizing frequency division multiplexing.

39. The apparatus according to claim 38, wherein said means for multiplexing comprises one or more splitters.

40. The apparatus according to claim 1, further comprising means for demultiplexing a plurality of low frequency telephony lines from said high speed data stream comprising a higher frequency spectrum utilizing frequency division multiplexing.

41. The apparatus according to claim 40, wherein said means for demultiplexing comprises one or more splitters.

42. The apparatus according to claim 1, further comprising a power switch adapted to switch a plurality of telephony lines to said plurality of copper pair lines, said power switch operative to disconnect a particular telephony line from a copper pair line in the absence of a concurrent telephony session and to connect said copper pair line to a source of electrical power so as to provide electrical power feeding to a remote node.

43. The apparatus according to claim 1, further comprising means for feeding of electrical power to one or more components located in a remote node situated on the opposite end of said plurality of copper pair lines.

44. The apparatus according to claim 1, further comprising means for assigning data rates to modem elements in accordance with the quality of a line corresponding thereto.

45. The apparatus according to claim 1, further comprising means for measuring line isolation, comprising:

means for turning on said plurality of modem elements while not transmitting signal onto said copper pair lines;

means for measuring the noise level on each twisted copper pair line, the measured noise level representing the relative isolation of a line from external disturbers; and

means for allocating more isolated lines to more sensitive signals.

46. The apparatus according to claim 1, wherein said encoder is adapted to provide a first bit error rate (BER) that is better than that required by a user in the absence of line failures and to provide a second BER in the event one or more lines fail wherein said second BER is worse than said first BER but still better than that required by said user.

47. The apparatus according to claim 1, wherein said error correction encoding scheme comprises Reed Solomon block encoding.

48. The apparatus according to claim 1, wherein said error correction decoding scheme comprises Reed Solomon block decoding.

49. The apparatus according to claim 1, wherein said encoder is operative to generate a plurality of codewords of length K, each codeword consisting of a payload portion containing K-R bytes and a redundancy portion consisting of R bytes.

50. The apparatus according to claim 1, wherein said encoder is operative to generate a plurality of codewords, each codeword consisting of a payload portion containing K-R bytes and a redundancy portion consisting of R bytes, wherein K and R are chosen such that no more than R/2 symbols are corrupted thus providing resiliency to a specified number of cut lines.

51. The apparatus according to claim 1, further comprising means for selecting the parameters for the codewords generated by said encoder so as to provide desired resiliency to line failures, minimum bit error rate (BER) and maximum bandwidth, said parameters consisting of K and R, wherein K-R represents the number of bytes in a payload portion of said codeword and R represents the number of bytes in a redundancy portion of said codeword.

52. A method of selecting the parameters for codewords generated by an encoder so as to provide desired resiliency to line failures, minimum bit error rate (BER) and maximum bandwidth, said parameters consisting of K and R, wherein K-R represents the number of bytes in a payload portion of said codeword and R represents the number of bytes in a redundancy portion of said codeword, wherein said codewords are distributed to a plurality of modem elements for transmission over a plurality of low bandwidth twisted copper pair lines, each modem having a data rate independent of other modem elements, said method comprising the steps of:

for all valid combination of codeword size K and redundancy length R, computing the maximum number of bytes from a codeword to be sent over each modem in accordance with its corresponding data rate;

for all combinations of line failures, summing the number of bits from a single codeword to be transmitted;

marking this combination only if said sum is less than R/2;

for all marked combinations, computing the overhead; and

selecting from among all combinations of K and R wherein an associated overhead was computed, the combination yielding a minimum overhead.

53. The apparatus according to claim 1, wherein said dispatcher comprises means for generating a spatial frame for transmission over each of said twisted copper pair lines, said spatial frame comprising a header portion and a plurality of codewords.

54. A dispatcher for distributing a high speed data stream among a plurality of modem elements, comprising:

a two dimensional buffer comprising a plurality of cells arranged as a plurality of rows and columns, each row associated with a different modem and each column representing a single symbol, transmitted at the highest transmission rate;

an input sequencer adapted to distribute said high speed data stream to cells in said buffer, the amount of data distributed to each row is determined in accordance with the particular data rate of the modem corresponding thereto; and

an output sequence adapted to distribute the contents of the cells in said buffer to said plurality of modem elements.

55. The dispatcher according to claim 54, wherein said input sequencer comprises filling means for:

filling the cells of said buffer with bytes beginning with the first cell of the first row;

finding the next available cell in said buffer;

placing a byte in the next available cell if the maximum allowable number of bytes from one codeword have not yet been placed in the particular row; and

repeating said steps of finding and placing for all codewords in one cycle of said input sequencer.

56. The dispatcher according to claim 55, wherein said filling means comprises filling any unfilled cells with null symbols.

57. The dispatcher according to claim 1, further comprising means for transmitting periodically a spatial frame synchronization word over said plurality of twisted pair lines, said spatial frame synchronization word operative to compensate for variable delays in each of said twisted pair lines.

58. A method of transporting a high speed data stream over a plurality of relatively low bandwidth twisted copper pair lines, said method comprising the steps of:

providing a plurality of modem elements, each modem coupled to a twisted pair line;

dividing said high speed data stream into a plurality of low rate data streams for distribution over said plurality of modem elements;

transmitting said plurality of low rate data streams via said plurality of modem elements over said plurality of twisted pair lines;

adapting the data rate of each modem in accordance with the quality of the twisted pair line associated therewith;

receiving a plurality of low rate data streams over said plurality of twisted pair lines; and

assembling said plurality of low rate received data streams so as to yield the original high speed data stream.

59. The method according to claim 58, said step of dividing comprises the step of interleaving said high speed data stream before distribution to said plurality of modem elements.

60. The method according to claim 58, wherein said step of assembling comprises the step of de-interleaving said received high speed data stream.

61. The method according to claim 58, wherein said step of dividing further comprises the step of dividing codewords generated by encoding said high speed data stream into a plurality of shorter data segments, said shorter data segments distributed to said plurality of modem elements such that during any period of time only a portion of a codeword is transmitted over said plurality of twisted copper pair lines so as to provide protection from burst noise.

62. The method according to claim 58, further comprising the step of scrambling said high speed data stream.

63. The method according to claim 58, further comprising the step of de-scrambling said received speed data stream.

64. The method according to claim 58, wherein said plurality of twisted copper pair lines comprises the local loop plant.

65. The method according to claim 58, wherein said plurality of modem elements comprises a plurality of Asymmetric Digital Subscriber Line (ADSL) modem elements.

66. The method according to claim 58, wherein said plurality of modem elements comprises a plurality of High speed Digital Subscriber Line (HDSL) modem elements.

67. The method according to claim 58, wherein said plurality of modem elements comprises a plurality of High speed Digital Subscriber Line 2 (HDSL2) modem elements.

68. The method according to claim 58, wherein said plurality of modem elements comprises a plurality of Symmetric Digital Subscriber Line (SDSL) modem elements.

69. The method according to claim 58, wherein said plurality of modem elements comprises a plurality of Very high speed Digital Subscriber Line (VDSL) modem elements.

70. The method according to claim 58, wherein said plurality of modem elements comprises a plurality of Discrete Multitone (DMT) modem elements.

71. The method according to claim 58, further comprising the step of providing one or more service channel modules adapted to provide an interface between a telephony service and said high speed data stream.

72. The method according to claim 71, wherein said service channel module is adapted to interface to T1 telephony service.

73. The method according to claim 71, wherein said service channel module is adapted to interface to E1 telephony service.

74. The method according to claim 71, wherein said service channel module is adapted to interface to T3 telephony service.

75. The method according to claim 71, wherein said service channel module is adapted to interface to E3 telephony service.

76. The method according to claim 71, wherein said service channel module is adapted to interface to Integrated Services Digital Network (ISDN) telephony service.

77. The method according to claim 71, wherein said service channel module is adapted to interface to Plain Old Telephone Service (POTS).

78. The method according to claim 58, further comprising the step of performing measurements, on a periodic basis, of one or more twisted pair line parameters.

79. The method according to claim 78, wherein said line parameters comprise crosstalk between said twisted pair lines at various frequencies.

80. The method according to claim 78, wherein said line parameters comprise Near End Crosstalk (NEXT) transfer functions at various frequencies.

81. The method according to claim 58, further comprising the step of measuring, on a periodic basis, one or more twisted pair line parameters and in accordance with said

measurements, transmitting more sensitive low rate data streams over more spatial centrally located pairs within a binder.

82. The method according to claim 58, further comprising the step of measuring, on a periodic basis, one or more twisted pair line parameters and in accordance with said measurements, transmitting more robust low rate data streams over pairs situated closer to the outer boundary of a binder.

83. The method according to claim 58, further comprising the step of measuring, on a periodic basis, one or more twisted pair line parameters and in accordance with said measurements, providing variable gain control to individual pairs within a binder such that higher transmission power is assigned to the more centrally situated pairs of a binder.

84. The method according to claim 58, further comprising the step of excluding a particular twisted pair line from the plurality of twisted pair lines used for transmission of said high speed data stream in the event the quality of said particular twisted pair line drops below a threshold.

85. The method according to claim 58, further comprising the steps of:

measuring a plurality of cable parameters including near end crosstalk between twisted pairs; and

canceling near end crosstalk from said received data stream in accordance with said cable parameter measurements.

86. The method according to claim 58, further comprising the steps of:

generating an estimate of a NEXT transfer function of the crosstalk caused by radiators nearby to a modem;

generating an estimate of a NEXT disturbance signal in accordance with said estimated NEXT transfer function; and

subtracting said estimate of a NEXT disturbance signal from the signal received by a modem.

87. The method according to claim 58, further comprising the step of spatially mapping the internal structure of the cable and one or more binder sub units integral thereto containing said plurality of copper pair lines so as to yield the binder and relative position within a binder a copper pair line is located in.

88. The method according to claim 87, further comprising the step of assigning more spatial central pairs for upstream transmission and less spatial central pairs for downstream transmission.

89. The method according to claim 87, further comprising the step of applying selective gain control to different pairs within a binder in accordance with their relative position therein while limiting spectral emission at the outer boundary of said binder.

90. The method according to claim 87, further comprising the step of allocating different binders within said cable to separate high speed data streams.

91. The method according to claim 58, further comprising the step of transmitting said high speed data stream simultaneously with existing lower rate telephony signals over said plurality of copper pair lines.

92. The method according to claim 58, further comprising the step of multiplexing a plurality of lower rate telephony lines with said high speed data stream utilizing time division multiplexing.

93. The method according to claim 58, further comprising the step of demultiplexing a plurality of lower rate telephony lines from said high speed data stream utilizing time division multiplexing.

94. The method according to claim 58, further comprising the step of multiplexing a plurality of low frequency telephony lines with said high speed data stream comprising a higher frequency spectrum utilizing frequency division multiplexing.

95. The method according to claim 58, further comprising the step of demultiplexing a plurality of low frequency telephony lines from said high speed data stream comprising a higher frequency spectrum utilizing frequency division multiplexing.

96. The method according to claim 58, further comprising the steps of:

switching a plurality of telephony lines to said plurality of copper pair lines;

disconnecting a particular telephony line from a copper pair line in the absence of a concurrent telephony session; and

connecting said copper pair line to a source of electrical power so as to provide electrical power feeding to a remote node.

97. The method according to claim 58, further comprising the step of feeding electrical power to one or more components located in a remote node situated on the opposite end of said plurality of copper pair lines.

98. The method according to claim 58, further comprising the step of assigning data rates to modem elements in accordance with the quality of line corresponding thereto.

99. The method according to claim 58, further comprising the steps of:

turning on said plurality of modem elements while not transmitting signal onto said copper pair lines;

measuring the noise level on each twisted copper pair line, the measured noise level representing the relative isolation of a line from external disturbers; and

allocating more isolated lines to more sensitive signals.

100. The method according to claim 58, further comprising the step of encoding said high speed data stream so as to provide a first bit error rate (BER) that is better than that required by a user in the absence of line failures and to provide a second BER in the event one or more lines fail wherein said second BER is worse than said first BER but still better than that required by said user.

101. The method according to claim 58, further comprising the step of error correction encoding said high speed data stream utilizing Reed Solomon block encoding.

102. The method according to claim 58, further comprising the step of error correction decoding said high speed data stream utilizing Reed Solomon block decoding.

103. The method according to claim 58, further comprising the step of error correction encoding said high speed data stream so as to generate a plurality of codewords of length K, each codeword consisting of a payload portion containing K-R bytes and a redundancy portion consisting of R bytes.

104. The method according to claim 58, further comprising the step of error correction encoding said high speed data stream so as to generate a plurality of codewords, each codeword consisting of a payload portion containing K-R bytes and a redundancy portion consisting of R bytes, wherein K and R are chosen such that no more than R/2 symbols are corrupted thus providing resiliency to a specified number of cut lines.

105. The method according to claim 58, further comprising the steps of:

error correction encoding said high speed data stream;

selecting the parameters for the codewords generated by said encoding so as to provide desired resiliency to line failures, minimum bit error rate (BER) and maximum bandwidth; and

wherein said parameters consist of K and R, wherein K-R represents the number of bytes in a payload portion of said codeword and R represents the number of bytes in a redundancy portion of said codeword.

106. A method of selecting the parameters for codewords generated by an encoder so as to provide desired resiliency to line failures, minimum bit error rate (BER) and maximum bandwidth, said parameters consisting of K and R, wherein K-R represents the number of bytes in a payload portion of said codeword and R represents the number of bytes in a redundancy portion of said codeword, wherein said codewords are distributed to a plurality of modem elements for transmission over a plurality of low bandwidth twisted copper pair lines, each modem having a data rate independent of other modem elements, said method comprising the steps of:

for all valid combination of codeword size K and redundancy length R, computing the maximum number of bytes from a codeword to be sent over each modem in accordance with its corresponding data rate;

for all combinations of line failures, summing the number of bits from a single codeword to be transmitted;

marking this combination only if said sum is less than R/2;

for all marked combinations, computing the overhead; and

selecting from among all combinations of K and R wherein an associated overhead was computed, the combination yielding a minimum overhead.

107. The method according to claim 58, further comprising the step of generating a spatial frame for transmission over each of said twisted copper pair lines, said spatial frame comprising a header portion and a plurality of codewords.

108. A dispatcher for distributing a high speed data stream among a plurality of modem elements, comprising:

a two dimensional buffer comprising a plurality of cells arranged as a plurality of rows and columns, each row associated with a different modem and each

column representing a single symbol, transmitted at the highest transmission rate;

an input sequencer adapted to distribute said high speed data stream to cells in said buffer, the amount of data distributed to each row is determined in accordance with the particular data rate of the modem corresponding thereto; and

an output sequence adapted to distribute the contents of the cells in said buffer to said plurality of modem elements.

109. The dispatcher according to claim 108, wherein said input sequencer comprises filling means for:

filling the cells of said buffer with bytes beginning with the first cell of the first row;

finding the next available cell in said buffer;

placing a byte in the next available cell if the maximum allowable number of bytes from one codeword have not yet been placed in the particular row; and

repeating said steps of finding and placing for all codewords in one cycle of said input sequencer.

110. The dispatcher according to claim 109, wherein said filling means comprises filling any unfilled cells with null symbols.

111. The dispatcher according to claim 108, further comprising means for transmitting periodically a spatial frame synchronization word over said plurality of twisted pair lines, said spatial frame synchronization word operative to compensate for variable delays in each of said twisted pair lines.